tomography is almost mandatory in the preoperative evaluation of extremity tumors and is most helpful in the design of muscle group resection or decision to amputate. Computerized tomographic lung examination is also the best way to search for metastatic pulmonary nodules.

Consultation with a surgical pathologist and a surgeon experienced in extremity surgical procedures is advisable before taking a biopsy specimen of a probable primary malignancy. An unconsidered biopsy study, particularly in a difficult location, may lead to excess blood loss and excessive regional dissemination of tumor cells, and may complicate the definitive en bloc resection of the biopsy tract or surgical scar with the major tumor.

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Management of Musculokeletal Sarcomas

SARCOMAS ARISING in the locomotor tissues are dangerous for several reasons. First, they are rare (less than one percent of all malignant lesions) so a high index of suspicion is necessary or else cancer will be forgotten in the differential diagnosis. Second, metastases tend to occur early and are difficult to discover. Third, these tumors have a pseudocapsule and are easily "shelled out," leaving a surface of raw tissue with residual tumor cells to find their way into the blood and lymph vessels. Fourth, manipulation and bleeding at the time of biopsy cause dissection along tissue planes which spread living tumor cells relatively far from the surgical site. Finally, they may become locally advanced before they cause enough symptoms to be noticed. When the tumor is discovered, an *immediate investigation* is in order since the tumor will have been present for a long time.

The first step is to establish the diagnosis with certainty. There are perhaps two dozen types of sarcomas of soft tissues each of which has its proclivities as to sex, body location, local aggressiveness, tendency to metastasize, response to treatment modalities and ultimate prognosis. Because mesenchymal tissues are derived from common stem cells, sarcomas may be quite primitive locally even when otherwise diffierentiated. There may even be different tissues in the tumor. The surgical pathologist then is often faced with a bewildering histopathological problem in diagnosis. Obviously, the rarity of these tumors affords maximum experience to only a few surgical pathologists. A frozen section examination is not realistic at the time of biopsy because consultation, special stains and occasionally electron microscopy may be necessary before diagnosis.

The second step determines the stage of the tumor: local, regional or distant. Angiography and computerized axial tomography are helpful in showing the extent of the tumor and its relationship to bone, nerve and blood vessels. Ultrasound imaging is less helpful. Lymphography is being studied but is as yet not proven to be useful in planning surgical therapy or radiotherapy. If routine x-ray films of the chest are negative, pulmonary computerized axial tomography will identify metastases less than a centimeter in diameter. Radionuclide bone scan is helpful in finding asymptomatic skeletal metastases. Liver and brain scans are optional, but have not proven helpful unless there is a specific indication.

Cancer persists in at least two thirds of local excisions and up to a third of patients who are managed by radical excision, depending on several variables. Radical local excision must include one full uninvaded tissue-plane from the tumor in all three dimensions. This may necessitate resection of bone or major muscles, amputation or skin grafting. Additionally, vascular or nerve resection and reconstruction will occasionally be mandated by clinical, angiographic, electromyographic or operative findings. External megavoltage radiotherapy may be advisable to sterilize any residual locally micropersistent tumor cells. Interstitial after-loading techniques using iodine 125 or iridium 192 may be helpful for macro-locally-persistent tumor, or to sterilize the tumor bed. Using this, the irradiation dose can be pushed to 10,000 rads in a small volume of tissue using this still-evolving technique. Adjuvant doxorubricin cycled with high dose methotrexate and citrovorum rescue, or with moderate dose methotrexate, have been shown to improve survival and disease free intervals in many of the soft tissue sarcomas. Other agents and combinations are also being used as adjuvant chemotherapy. Wound healing must be uncomplicated before initiating external irradiation or these medications and if

radiotherapy and chemotherapy are given simultaneously, modifications in dosages must be made or serious synergistic effects may occur. Development of a treatment program will usually require consultation among a surgeon, a radiotherapist and an oncologist.

Pulmonary macrometastases, although ominous, can be wedged-resected, with occasional satisfying prolongation of disease free intervals. Several lesions, even if bilateral, may still be amenable to resection. Failure of local control, rapid appearance of pulmonary lesions, or perhaps a rapid "doubling time" is a relative contraindication to this somewhat aggressive but occasionally rewarding palliative surgical therapy. The effects of manipulating the immune system are still unpredictable, but work is progressing in this difficult but intriguing area.

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The Use of Antibiotics in Open Fractures

UNTIL RECENTLY the use of prophylactic systemic antibiotics in open fracture treatment was a controversial subject with some published reports supporting their use and others finding them of little or no value.

In 946 open fractures treated at the Los Angeles County/University of Southern California Medical Center, we have found that bacterial contamination was present in approximately 63 percent of the open wounds cultured. The infection rate was significantly reduced by the use of an antistaphylococcal wide-spectum agent (cephalothin [Keflin]) in patients with open wounds (2.3 percent), when compared with a control group receiving no antibiotics (13.9 percent) and a control group receiving penicillin and streptomycin (9.7 per cent).

Based on these data, wide-spectrum systemic antibiotics should be used as an adjunct to surgical irrigation and debridement to treat contaminated wounds and reduce the incidence of infection. Wide-spectrum antistaphylococcal systemic antibiotics should be administered as soon as possible following injury after a wound culture has first been taken. The selection of antibiotics will vary from institution to institution with the experience of what organisms and what sensitivities are found in open fractures being used as a guide to antibiotic selection. Antibiotics that seem effective based on our experience are a cephalosporin used alone, a synthetic penicillin given with an aminoglycoside, and a cephalosporin given with an aminoglycoside.

The term prophylactic antibiotics is not appropriate since open fracture wounds are contaminated, and surgeons are in fact treating by giving antibiotics. Based on our data the use of antibiotics in the management of open fractures is unequivocally indicated. MICHAEL J. PATZAKIS, MD

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Scoliosis Screening

SCHOOL SCREENING PROGRAMS for detection of adolescent scoliosis have been endorsed by the Scoliosis Research Society and the American Academy of Orthopaedic Surgery. Many such programs have been implemented across the nation. The primary screening program is done in the school. The forward bend test is a reasonably discriminating method of detecting asymmetry of the back suggesting scoliosis. The technique is easily taught and with a minimum of experience the nurse examiner will become very proficient. This becomes an efficient program requiring physician participation only at the secondary screening level. Most programs in primary screening detect about 10 percent of children as having some back asymmetry.

At the secondary screening centers, single standing anteroposterior roentgenograms of the spine are taken for permanent record of the curvature and appropriate measurements of curves are made. False positive findings on primary screening occur in about 2 percent of cases. Of the remaining 8 percent, most of the students receive continued observation and are referred to physicians in the community. About 1 percent are referred for specific treatment, usually bracing. The goal of screening programs is to